

Metering valve

The present invention relates to an improved metering valve.

Valves are well known in the state of the art. They find their principal application in aerosol containers for delivery of liquid products which are charged with propellant (gas under pressure). When they are in the form of metered dose valves, they generally consist of a valve body enclosing a metering chamber bound axially by two ring seals, a valve seal and a chamber seal, and a valve stem movable between a rest position and an actuation position. This stem is held by a spring in the rest position in which the shoulder of the aforementioned stem presses against the lower surface of the aforementioned valve seal. To actuate the metering valve one presses on the stem, which slides into the valve body inside the seals up to its actuation position, in which a dose of the product is expelled. This spring then returns the stem to its rest position. Metering valves of this type are described in documents EP-0 551 782, FEP-0 350 376, FR-2 615 172, FR-2 615 173 and FR-2 615 124.

The document FR-2 740 527 discloses a metering valve in which, in order to avoid a risk of blocking the stem in the seal assembly, one constructs the stem out of a material containing PTFE mixed with other materials.

One problem which arises with metering valves concerns notably the precision and reproducibility of the dose expelled at each actuation. Indeed, depending on the product to be dispensed, notably when it consists of a pharmaceutical product, these two parameters can be crucial for the efficacy of the treatment. Here, the pressure generated in the valve by the gas propellant and/or the physico-chemical properties of the aforementioned gas propellant can bring about accumulation, adhesion and/or coating of the product on different constituent parts of the metering valve. Thus the precision and reproducibility of the dose are not always guaranteed. Furthermore, a part of the product contained in the container runs the risk of not being dispensed, which risks limiting the efficacy of the treatment, and may be disadvantageous from

the economic point of view if the product in question is costly. In addition, accumulation, adhesion and/or coating of the product on certain parts of the metering valve may alter considerably the functioning and reliability of the aforementioned metering valve (a phenomenon known as sticking of the stem, which becomes  
5 blocked) or the replenishment of the metering chamber (constriction of the refill conduit, which can be very narrow).

These phenomena are amplified further when, notably for ecological reasons, one wishes to replace gas propellants harmful to the environment, such as the CFCs,  
10 by gas propellants which are not harmful, or less so, such as the HFA gases. Indeed, the use of such non-harmful or less harmful gases entails an increase in pressure in the interior of the valve body. Moreover, the physico-chemical properties of this type of gas propellant can predispose to accumulation, adhesion and/or coating of product.

15 One aim of the invention is to provide a metering valve which guarantees the precision and reproducibility of the dose of product expelled at each actuation.

Another aim of the invention is to provide a metering valve functioning in a certain and reliable manner to guarantee the expulsion of the totality of product  
20 contained in the vessel upon which the valve is mounted.

Yet another aim of the invention is to provide such a metering valve functioning with a gas less harmful to the environment.

25 The invention has, therefore, as its objective a metering valve for dispensing a pharmaceutical product, consisting notably of a valve body, a metering chamber and a valve stem sliding into the aforementioned metering chamber between a position of rest and a position of actuation, with at least a part of the aforementioned metering valve being made of a material adapted to reduce the deposition, adhesion and/or  
30 coating of the product on the valve.

Preferably, the aforementioned metering chamber is made of a material adapted to reduce the deposition, adhesion and/or coating of product on the aforementioned metering chamber, in particular on its wall.

5            Advantageously, the aforementioned valve stem is made of a material adapted to reduce the deposition, adhesion and/or coating of product on the aforementioned valve stem.

10           Advantageously, all the components of the valve are made of a material adapted to reduce the deposition, adhesion and/or coating of product on the valve.

In particular, all the components of the metering valve contain the same material adapted to reduce the deposition, adhesion and/or coating of the product on the valve.

15           Preferably, the material adapted to reduce the deposition, adhesion and/or coating of the product contains a fluorinated polymer.

20           Advantageously, this polymer is composed essentially of a fluorinated polymer.

Preferably, this polymer contains polytetrafluoroethylene (PTFE).

25           Advantageously, this polymer consists essentially of polytetrafluoroethylene (PTFE).

30           In addition, the present invention has as its objective a device for the dispensing of a liquid product consisting of an aerosol container containing the product and a propellant gas, and a metering valve made according to one of the preceding claims, mounted on the aforesaid container for the selective dispensing of the said product, said propellant gas being an HFA gas.

Other characteristics and advantages will appear during the course of the following detailed description of the invention, acting as a non-limiting example in regard to the accompanying drawings in which:

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- figure 1 is a schematic view in section of a metering valve according to a particular mode of realisation, the valve stem being in a position of rest, and
  - figure 2 is a view similar to that in figure 1, the valve stem being in its actuation position.
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The invention will be described with reference to an example of a metering valve represented in the drawings, but it is clear that it applies to metering valves of all types.

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With reference to figures 1 and 2, a metering valve can consist of a valve body 1 enclosing a metering chamber 2. This chamber 2 may be bound axially by two ring seals, a valve seal 3 and a chamber seal 4. These two seals can each contain a central opening through which a valve stem 10 passes, which can move inside the valve body

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between a position of rest, shown in figure 1, and a position of actuation, shown in figure 2. This valve stem may be held in the rest position by an elastic component such as a spring 5, one part pressing against the base of the valve body 1 and the other part against the lower end of the valve stem.

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The valve body 1 may be set in a capsule 100 which is then secured, for example by crimping, to the collar of a vessel or bottle of some sort (not shown). Advantageously, a collar seal 101 is envisaged between said capsule 100 and said collar of the container.

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The valve stem generally contains a dispensing channel 12 opening through a radial hole 13 to the outside. In the rest position of the valve stem, said radial hole 13

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opens to the exterior of the valve seal 3, while in the said actuation position it opens to the interior of the metering chamber 2.

5 The valve stem 10 may have, in addition, a radial shoulder which presses against the lower surface of the valve seal 3 in the rest position of the valve stem 10, and which defines the said rest position in acting as an agent of closure against the pressure of the spring 5.

10 The valve stem 10 also contains advantageously a conduit 14, which in the rest position of the valve stem, connects a reservoir or container of product (not shown) with the metering chamber 2 allowing the latter to be refilled, while in the position of actuation of the valve stem, it does not open into the metering chamber 2.

15 This metering valve functions in a standard manner. The user exerts pressure on the valve stem 10 which has the effect of displacing the latter, against the force of the spring 5, from its position of rest. Once this displacement has begun, the conduit 14 no longer opens out into the metering chamber 2, and the latter is then hermetically sealed by the valve stem 10 at the level of the chamber seal 4 and the valve seal 3. When the valve stem 10 arrives in its position of actuation, the radial hole 13 of the  
20 valve stem opens into the metering chamber 2, thus allowing the dispensing of the dose of product contained in said metering chamber via the intermediary of the dispensing channel 12. The user releases the pressure on the valve stem 10, which is returned by the spring 5 to its rest position, where the conduit 14 opens into the metering chamber 2, in order to refill the latter with a new dose of product.

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To guarantee the precision and reproducibility of the dose, and to avoid problems of blockage of the valve stem 10 (sticking) and constriction of the refill conduit 14 of the metering chamber 2, the invention envisages that all or part of the metering valve is made of a material adapted to reduce, preferably to prevent, the  
30 deposition, adhesion and/or coating of product.

Preferably, the metering chamber 2, notably its walls, is made of such a material, but other components of the metering valve, such as the valve stem 10 or the valve body 1 can also be made of such material.

5 A material particularly adapted for the invention consists of or contains a fluorinated polymer. This polymer preferably consists of or contains polytetrafluoroethylene (PTFE). Other appropriate fluorinated materials comprise fluorinated ethylene propylene (FEP) and a copolymer of PTFE (PFA).

10 Advantageously, the same material may be used to make the different parts of the metering valve.

Thus, the invention allows one to make a metering valve in which the metering chamber 2 fills in a very precise manner after each actuation of the valve and  
15 the majority, if not the totality, of the contents of the metering chamber is expelled at each actuation such that the dose is very precise and reproducible. Furthermore, the fact that the product does not coat on the valve stem 10 and/or the seals 3 and 4 allows one to avoid problems with blockage by rubbing of the said stem and so improves the reliability of the valve.

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The invention has been described with reference to the figures which show a particular metering valve functioning in the upright position, but it clearly applies to all metering valves, notably also those functioning in the inverted position.